

Official Amendment

Serial No. – 10/625,886

Docket No. – UVD 0299 IA/UD 268

REMARKS

Claims 1-8, 10-11, 35-55, 137, and 140-163 were pending in the present application. Claims 39, 40, and 48-49, are withdrawn from consideration. As a result of this amendment, claims 1-8, 10-11, 35-38, 41-47, 50-55, 137, and 140-163 are currently under examination. Reexamination and reconsideration are requested in light of the accompanying amendments and remarks.

Applicants gratefully acknowledge the allowance of claims 140-163.

Applicants gratefully acknowledge the withdrawal of the rejection of various claims over DePue alone or in combination with other references.

The rejection of claims 1-7, 10-11, 35-38, 41-42, 44-47, 50-55, and 137 under 33 U.S.C. § 103(a) as being unpatentable over PCT publication WO 98/48075 (treated as equivalent to U.S. Patent No. 6,200,672 to Tadokoro) in view of U.S. Application 2003/0185990 (Bittner) has been overcome.

Tadokoro teaches “a surface treated metal sheet which is coated with a layer comprising as main components, *a complex and/or salt between a rare earth metal element and an organic compound* having in the molecule one or more functional groups selected from among -O-, =O-, -OH, -COOH, -NH₂, -NH-, =N-, -SH, -SO₃H and phosphoric groups, and *a matrix which physically holds the above and has adhesive power for metal sheets*, as well as a metal surface treatment solution used therefore.” Abstract.

According to the examiner, “Tadokoro teaches an aqueous metal surface treatment fluid comprising a rare earth element complex of an organic compound and a rare element such as tetravalent cerium (col. 4 lines 52-54, col. 5 lines 6-9) and a matrix providing adhesive power to physically hold the complex to metal surfaces (col. 3 lines 12-20). Tadokoro further teaches the rare earth metal complex further comprises an inorganic compounds [sic] such as phosphates, nitrates and sulfates (col. 5 lines 27-31). The matrix as taught by Tadoko [sic] comprises oxyacid anions such as phosphate, tungstate, vanadate anions, wherein the rare earth metal

Official Amendment

Serial No. – 10/625,886

Docket No. – UVD 0299 IA/UD 268

elements and the oxyacid anions form oxyacid compounds (col. 9 lines 28-33).” The examiner further stated that “Regarding claims 1 and 10-11, the tetravalent cerium complex of Tadokoro reads on the claimed rare earth complex with the rare earth element in tetravalent oxidation state. The phosphate, sulfate and nitrate inorganic and nitrate inorganic compound in the rare earth metal complex of Tadokoro read on the claimed inorganic valence stabilizer.”

Although Tadokoro mentions the use of tetravalent cerium, it does not teach that “at least one rare earth element is in the tetravalent oxidation state in the rare earth/valence stabilizer complex in the solid corrosion-inhibiting seal,” as in claims 1, and 137. The fact that tetravalent cerium is present in the starting solution, as shown in the Examples and Tables 1 and 2, does not mean it is present in the complex in the pigment composition. Tetravalent cerium compounds in solution can easily form trivalent compounds in formed films or react to form other compounds. The anticorrosion performance of coatings that contain complexes of trivalent rare earths and of tetravalent rare earths is notably different. With complexes containing trivalent rare earths, the formed coating is simply a barrier film which prevents corrosive species from reaching the metal.

Tadokoro teaches that the valence of the rare earth metals does not matter.

Rare earth metal elements have anti-corrosion functions, although the mechanism thereof is not clear. *Any rare earth metal element* may be used in the rare earth metal complex (i.e. the complex and/or salt of the organic compound and rare earth element) used for the invention, and *there are no particular restrictions on the valency of the rare earth metal at the time the rare earth metal complex is formed*. Lanthanoids and/or yttrium are preferred from the standpoint of ease of handling, while from an economical standpoint, lanthanum or cerium is preferred, and tetravalent cerium which also has oxidizing power is even more preferred.

Col. 4, line 65 to col. 5, line 9.

The examiner agreed that Tadokoro teaches that the valency of the rare earth metal complex is not particularly important. However, according to the examiner, “Tadokoro also specifically

Official Amendment

Serial No. – 10/625,886

Docket No. – UVD 0299 IA/UD 268

teach [sic] that tetravalent cerium is preferred, and the tetravalent cerium is placed in the context of the rare earth metal complex formed (col. 4, line 65-col. 5, line 9). Based on this teaching, the examiner believes that the cerium in the rare earth metal complex of Tadokoro is in the claimed tetravalent oxidation state.” While Applicants agree that Tadokoro teaches that tetravalent cerium is preferred, Tadokoro does not teach that the preference for tetravalent cerium relates to the rare earth metal *in the complex*. Tadokoro states that “there are no particular restrictions on the valency of the rare earth metal *at the time the rare earth metal complex is formed*.” Thus, Tadokoro’s preference for tetravalent cerium refers to the rare earth elements used to form the complexes and not to the formed complexes.

This is clear from the fact that Tadokoro does not describe testing any of the complexes formed to determine whether the *rare earth metal in the complex* has any particular valence, much less a tetravalent oxidation state.

In any event, Applicants have shown that Tadokoro’s procedures do not result tetravalent cerium in the complexes formed, as discussed below.

Furthermore, the action of the organic species in Tadokoro is different from that of the claimed invention.

Since such an organic compound adheres to metal surfaces, it can effectively supply the rare earth metal to the metal sheet surface and, even after dissociating from the rare earth metal element in the layer when corrosion proceeds, *it forms a complex with the dissolved metal component of the metal sheet and precipitates*, thus inhibiting further ionization of the metal sheet.

Col. 6, lines 51-59. Thus, the organic species in Tadokoro are introduced such that *they bind with the metal ions supplied by the corroding metal itself*. In contrast, the valence stabilizers of the present invention are introduced to form stable tetravalent rare earth species in the *formed coating*.

The examiner stated that this argument was not persuasive “since the claims being examined are directed to an inorganic valence stabilizer, not an organic valence stabilizer. It is

Official Amendment

Serial No. – 10/625,886

Docket No. – UVD 0299 IA/UD 268

irrelevant how the organic species of Tadokoro functions or whether it acts the same as the instant invention.” Applicants agree that Tadokoro’s complex or salt is between a rare earth element and an *organic* compound. See Abstract; col. 2, lines 38-46, 52-61; col. 2, lines 12-20, 33-39, and 61-67; col. 4, lines 13-20; col. 5, lines 10-31; col. 6, line 40 to col. 7, line 13. Applicants also agree that the claims are directed to a rare earth/valence stabilizer complex containing an *inorganic valence stabilizer*. However, the claims were rejected based on Tadokoro. Therefore, Tadokoro’s description of how its complexes act is relevant. A prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention. MPEP 2141.02. The examiner cannot ignore the teachings of the reference.

Furthermore, Tadokoro is a non-enabling reference which does not anticipate the claimed invention. A reference must sufficiently describe the claimed invention to have placed the public in possession of it. A public disclosure will not suffice as prior art if it was not enabling. Although patents are presumed to be enabling, the presumption can be rebutted. MPEP 2121.02.

Applicants repeated Tadokoro’s experiments with catechol, dextrose (as a close surrogate for γ -cyclodextrin), and 2-hydroxynicotinic acid which were said in Tadokoro to produce tetravalent rare earth metal complexes, as well as with salicylic acid which is slightly less soluble than 2-hydroxynicotinic acid. Following Tadokoro’s process, catechol yielded a precipitate which did not contain either tetravalent cerium or trivalent cerium. 2-hydroxynicotinic acid and salicylic acid produced precipitates containing cerium III. Dextrose did not produce any precipitate, indicating that this complex is highly water soluble. As a result, it does not meet the solubility requirements of the claims and is unsuitable for use in a pigment composition. None of the reactions produced a cerium IV complex. See Paragraphs 3-10 of the Declaration of Jeffrey A. Sturgill filed with the Amendment of June 26, 2007.

The examiner stated that the Declaration of Jeffrey A. Sturgill filed with the Amendment of June 26, 2007 was insufficient to overcome the rejections based on Tadokoro because it did

Official Amendment

Serial No. – 10/625,886

Docket No. – UVD 0299 IA/UD 268

not provide sufficient evidence that the Tadokoro reference is not enabling. According to the examiner:

Tadokoro teaches that the solubility of its rare earth metal complex is no greater than 0.01 mol/l when pH is 6-7 (col. 5, lines 37-39). The results of Tadokoro's experiments are shown in Table 1. Applicant's repeat of Tadokoro's experiments in the declaration does not mention the solubility in of [sic] the rare earth metal complex with the exception of the dextrose solution, which shows high solubility. Therefore, the examiner does not think that Applicant has reproduced Tadokoro's experiments. In addition, the experiments are merely embodiments of Tadokoro's invention. They do not limit the scope of Tadokoro's invention. Therefore, the examiner maintains that Tadokoro teaches the claimed invention within its scope.

Contrary to the examiner's position, Tadokoro does not teach that the solubility of its rare earth metal complex is no greater than 0.01 mol/l when pH is 6-7. Although Tadokoro *prefers* that the solubility be no greater than 0.01 mol/l, it teaches that complexes with higher solubilities can be used if the structure of the matrix components is modified.

The rare earth metal complex used for the invention is *preferably* one that is poorly soluble in the neutral range, in order to impart long-term corrosion resistance in general use.

Specifically, the solubility of the rare earth metal complex in water at pH 6-7 is *preferably no greater than 0.01 mol/l* based on the rare earth metal element. *If the solubility at pH 5-8 is no greater than 0.01 mol/l based on the rare earth metal element, as is more preferred*, it will be possible to further maintain long-term corrosion resistance.

If the solubility in water at pH 6-7 is greater than 0.01 mol/l, the rare earth metal complex will readily elute from the layer in humid environments including rainwater and dew, so that the long-term anti-corrosion performance in humid environments will be reduced *unless the structure of the matrix components is modified. In the case of a rare*

Official Amendment

Serial No. – 10/625,886

Docket No. – UVD 0299 IA/UD 268

earth metal complex having a solubility in water at pH 6-7 exceeding 0.01 mol/l, the corrosion resistance can be maintained over long periods if the matrix structure is selected from non-water-soluble copolymer resins, telechelic resins, core/shell-type emulsion resins, non-water-soluble curable resins and oxyacid compounds of rare earth metal elements. Non-water-soluble copolymer resins, telechelic resins and core/shell-type emulsion resins have a molecular skeleton that exhibits high affinity for water and attaches to metal surfaces by adsorption, hydrogen bonding, etc. with the remainder a construction having a molecular skeleton with no affinity for water, as described below. Non-water-soluble curable resins are formed during the treatment layer formation by curing the coating material which includes water-soluble resin and crosslinking agents.

Col. 5, lines 32-63.

This is further supported by Tadokoro's data. Table I shows that the solubility of the γ -cyclodextrin complex at pH 6-7 is 0.1 mol/l or greater. This corresponds to the results of Applicants' experiment with dextrose, which showed high solubility. In addition, the first 4 complexes in Table I have a solubility of 0.1 mol/l or greater.

Tadokoro describes the preparation of the rare earth metal complexes and salts at col. 10, line 64 to col. 11, line 50. This procedure was followed by Applicants in repeating Tadokoro's experiments as described in Paragraphs 3-10 of the Declaration of Jeffrey A. Sturgill filed with the Amendment of June 26, 2007 and Paragraphs 3 and 5 of the Declaration of Jeffrey A. Sturgill filed with the present Amendment.

None of the reactions produced a cerium IV complex. The first time the reaction was performed with catechol, the solid did not have tetravalent or trivalent cerium in it. Paragraphs 3-10 of the Declaration of Jeffrey A. Sturgill filed with the Amendment of June 26, 2007. When the reaction was repeated in order to provide enough material for solubility testing, the material contained 0.0001 wt% cerium III. Paragraphs 5-6 of the Declaration of Jeffrey A. Sturgill filed with the present amendment. The solubility of the material was 4.3×10^{-5} mol/l. Two other compounds (2-hydroxynicotinic acid and salicylic acid) also produced precipitates that contained

Official Amendment

Serial No. – 10/625,886

Docket No. – UVD 0299 IA/UD 268

cerium III. Paragraphs 3-10 of the Declaration of Jeffrey A. Sturgill filed with the Amendment of June 26, 2007. The solubility of the complex with 2-hydroxynicotinic acid was 5.8×10^{-1} mol/l, and the solubility of the complex with salicylic acid was 7.1×10^{-3} mol/l. Paragraph 6 of the Declaration of Jeffrey A. Sturgill filed with the present amendment. Dextrose yielded a highly water-soluble complex that would be unsuitable for use as a pigment due to its affinity for water. Paragraphs 3-10 of the Declaration of Jeffrey A. Sturgill filed with the Amendment of June 26, 2007.

Furthermore, Tadokoro does not indicate that the complexes were tested to determine whether there was any cerium (IV) in the complexes formed. Paragraph 9 of the Declaration of Jeffrey A. Sturgill filed with the present amendment. As discussed above, simply because a cerium (IV) salt was used as a starting material does not mean that a cerium (IV) complex was formed.

With respect to the examiner's statement that the experiments are merely embodiments of Tadokoro's invention, and that they do not limit the scope of Tadokoro's invention, neither statement overcomes the fact that Tadokoro is not enabling for cerium (IV) complexes. The process described by Tadokoro for making a complex and/or salt of a rare earth metal and an organic compound does not yield a complex which contains cerium (IV), as shown by the Declaration of Jeffrey A. Sturgill filed with the present amendment, and the Declaration of Jeffrey A. Sturgill filed with the Amendment of June 26, 2007.

Thus, Tadokoro is a non-enabling reference and it would take undue experimentation to produce a tetravalent cerium complex using Tadokoro's disclosure. Therefore, Tadokoro does not anticipate the claimed invention.

Bittner is cited as teaching a method for coating a metal surface with a paint-like coating comprising at least one rare earth element compound (paragraphs [0110], [0116]), and that the metal substrate can be pretreated with phosphate to provide temporary protection of the metal surface (paragraph [0007]). However, Bittner does not remedy the deficiencies of Tadokoro.

Official Amendment

Serial No. – 10/625,886

Docket No. – UVD 0299 IA/UD 268

With respect to claim 7, the examiner stated that “since Tadokoro in view of Bittner teach a rare earth metal complex, the claimed central cavity containing cerium is inherently present in the rare earth metal complex. In addition, since specifics of the additional ions are not recited in the claim, any ions, such as impurities in the cavity of the rare earth metal complex, can read on the claimed additional ion.”

As discussed on p. 170, lines 1-19, in the case of the heteropolymetallates, there is a central cavity which can contain an ion in addition to cerium. Examples include silicomolybdates, phosphomolybdates, silicotungstates, and phosphotungstates. In these complexes, the central cavity contains a Si^{+4} or P^{+5} ion in addition to the cerium ion. The molybdenum or tungsten is not in the central cavity; rather, it forms the central cavity. Thus, in a cerium/vanadate complex as described in Tadokoro, the vanadium ion is not in the central cavity.

As to the statement that impurities in the cavity of the rare earth complex can read on the additional ion, the Office Action provides no support for the assertion that impurities in the rare earth metal complex would or could be located in the central cavity. Applicants respectfully request that the examiner provide evidence to support this assertion.

In response, the examiner stated that “Applicant further argues that the support for impurities in the rare earth metal complex in the central cavity of the rare earth metal complex is not provided in the previous Office Action. The examiner respectfully disagrees. Any coating solution would contain a certain level of impurities and the impurities are randomly distributed. Therefore, the impurities in the coating solutions of Tadokoro would also be randomly distributed throughout the coating solution including in the central cavity of the rare earth metal complex. Any impurity in the central cavity of the rare earth metal complex would read on the claimed additional ion.” However, this is an assertion by the examiner without any support. The examiner has not provided any support for the assertion that any of Tadokoro’s complexes would have a central cavity, or that impurities in the rare earth complex would or could be formed in the central cavity. Not all complexes have a central cavity, as discussed above. Since

Official Amendment

Serial No. – 10/625,886

Docket No. – UVD 0299 IA/UD 268

Tadokoro does not teach or suggest heteropolymetallates as discussed in the specification, it does not teach or suggest a central cavity, and thus there is no central cavity for an impurity.

With respect to claims 35-38, the examiner stated that “Tadokoro teaches the presence of cerium ions which read on the claimed cationic solubility control agent. Tadokoro further teaches the presence of calcium, zinc, lanthanum, hydrogen, zirconium, and titanium ions (col. 10, lines 9-18) which also read on the claimed cationic solubility control agent.”

Tadokoro does not teach that “the rare earth/valence stabilizer complex further comprises a solubility control agent,” as claimed. As discussed at p. 340, line 29 to p. 341, line 24, one of the roles of the valence stabilizer is to allow for formation of a tetravalent cerium, praseodymium, or terbium complex that has a specific solubility range. The anions or cations present in the coating solution may be sufficient to form a Ce^{+4} , Pr^{+4} , or Tb^{+4} -containing compound within the conversion coating that exhibits the desired solubility characteristics. Additional solubility control may be desirable to optimize the performance of the tetravalent cerium-, praseodymium-, or terbium-valence stabilizer complex. The initial formation of the conversion coating may produce Ce^{+4} , Pr^{+4} , or Tb^{+4} compounds with solubilities greater than optimal. Additional solubility control agents applied to a workpiece can enhance the Ce^{+4} , Pr^{+4} , or Tb^{+4} content of the coating by forming more insoluble compounds in place. Additional solubility control agents are typically applied as a second solution.

Tadokoro teaches that the layer and the treatment solution can include some additional materials.

There may also be added to the layer and treatment solution of the invention phosphoric acid or polyphosphoric acid as *passivation layer-forming aids*, or calcium hydroxide, calcium carbonate, calcium oxide, zinc phosphate, potassium phosphate, calcium phosphate, lanthanum phosphate, lanthanum hydrogen phosphate, cerium phosphate, cerium hydrogen phosphate, calcium silicate, zirconium silicate, aluminum phosphate, zirconium phosphate, TiO_2 , SiO_2 , Al_2O_3 , La_2O_3 , CeO_2 , etc. as *additional additives*.

Official Amendment

Serial No. – 10/625,886

Docket No. – UVD 0299 IA/UD 268

Col. 10, lines 10-18. Tadokoro teaches the use of certain compounds as passivation layer-forming aids, and others as additional additives in its layer. Tadokoro's compounds are not solubility control agents. They do not alter the solubility of the cerium-, praseodymium-, or terbium-valence stabilizer complex. They are simply additional components in the layer.

According to the examiner, "applicant's argument [is not] persuasive since Tadokoro teaches the claimed cerium, calcium, zinc, lanthanum, hydrogen, zirconium and titanium ions present in its coating composition as additives. Since they are the same ions as claimed for solubility control agent, they inherently functions [sic] as a solubility control agent as well." However, the additional compounds included in Tadokoro's composition do not form part of the rare earth-valence stabilizer complex, as claimed.

Therefore, claims 1-7, 10-11, 35-38, 41-42, 44-47, 50-55, and 137 would not have been obvious to one of ordinary skill in the art at the time the invention was made over Tadokoro in view of Bittner.

The rejection of claim 43 under 33 U.S.C. § 103(a) as being unpatentable over Tadokoro in view of Bittner and further in view of Gulley (U.S. Patent No. 5,330,588) has been overcome. Gulley is cited as teaching "the use of silver in a chemisorption layer on a metal part as a lubricant in order to averts [sic] high frictional forces." However, Gulley does not remedy the deficiencies of Tadokoro combined with Bittner. Therefore, claim 43 would not have been obvious to one of skill in the art at the time the invention was made over Tadokoro in view of Bittner and further in view of Gulley.

Because claim 1 is allowable and is a generic claim, Applicants respectfully request withdrawal of the species election requirements and rejoinder of claims 39, 40, and 48-49.

Applicants gratefully acknowledge the examiner's statement that claim 8 would be allowable if rewritten in independent form. Claim 8 was previously rewritten in independent form as claim 140.

Official Amendment

Serial No. – 10/625,886

Docket No. – UVD 0299 IA/UD 268

CONCLUSION

Applicants respectfully submit that, in view of the above amendment and remarks, the application is now in condition for allowance. Applicants respectfully request that claims 1-8, 10-11, 35-38, 41-47, 50-55, 137, and 140-164 be passed to allowance.

If the Examiner has any questions or comments regarding the present application, he is invited to contact the undersigned attorney at the telephone number indicated below.

Respectfully submitted,
DINSMORE & SHOHL LLP

By /Patricia L. Prior/
Patricia L. Prior
Registration No. 33,758

One Dayton Centre
One South Main Street, Suite 1300
Dayton, Ohio 45402-2023
Telephone: (937) 449-6400
Facsimile: (937) 449-6405

RAK/AMM/ems
Encls.